

Cardiac rehabilitation II: referral and participation

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Abstract

Cardiovascular disease (CVD) is the leading cause of death and disability for women and men. Substantial health risks continue following ischemic coronary events (ICEs), but secondary prevention efforts, including cardiac rehabilitation (CR), have beneficial effects on both early and late mortality and morbidity. This prospective study examined the relationship among psychosocial factors and CR referral and participation patterns in 906 (586 men, 320 women) patients from the coronary intensive care unit (CICU) over the course of six months. Only 30% of participants were referred to CR programs, with significantly fewer women being referred. A logistic regression analysis was used to determine whether depression, anxiety, self-efficacy, or social support predicted CR participation six months following an ICE, while controlling for sociodemographic factors. Results show that higher family income, greater anxiety symptomatology, and higher self-efficacy were significantly predictive of CR participation at six months. Implications for women's recovery from an ICE are discussed.

Keywords: Cardiac rehabilitation; Sex; Depression; Social support; Self-efficacy

1. Introduction

Cardiovascular disease (CVD) is the leading cause of death and disability for women and men in North America [1]. Substantial health risks continue following ischemic coronary events (ICEs), but secondary prevention efforts have beneficial effects on both early and late mortality and morbidity [2,3]. In addition to physiological factors, psychosocial and sociodemographic factors have been found to affect recovery from myocardial infarction (MI), unstable angina (UA), and other coronary events [4–7]. Accordingly, cardiac rehabilitation (CR) also plays a large role in augmenting recovery from an ICE.

CR typically includes core components of exercise and education, with a combination of multifactorial components such as psychological intervention, vocational rehabilitation, or pharmacological treatment [8]. The goals of CR are to promote secondary prevention and to improve quality of

life [9]. CR programs have been shown to have beneficial effects on mortality, exercise tolerance, functional capacity, lipid levels, blood pressure, symptoms of angina and dyspnea, weight loss, smoking behavior, stress level and psychosocial functioning [10–12]. In particular, it is now well established that cardiovascular mortality can be reduced by approximately 25% when patients participate in a multifactorial CR program [11].

However, most research demonstrates lower referral, participation and adherence in CR among women than men [13–16]. In general, 20% fewer women are enrolled in CR than men [17,18], and these female-to-male ratios are significantly lower than expected based on morbidity data [15]. This occurs despite the fact that after an MI, women are more likely to experience re-infarction [19,20], are twice as likely than men to die within the first few weeks, and are more likely to die within the first year [19,21], clearly demonstrating need for secondary prevention [21]. Moreover, women with CVD have poorer psychosocial adjustment, lower socioeconomic status, are older, more often widowed, living alone, and more likely to be retired or unemployed than men [17]. They more often have concom-

itant illness including diabetes, arthritis and hypertension [15,20], all factors that demonstrate a need for CR but may interfere with their ability to participate. Despite women's lower participation, they have been shown to benefit in functional capacity, coronary risk, and psychosocial well-being from CR [22–25]. Understandingly, there is growing concern to identify the barriers women face in accessing and adhering to CR. Psychosocial factors relevant to participation in CR include depression, anxiety, social support, and self-efficacy.

2. Objectives and hypotheses

This study has two goals. First, as studies have shown that women are less likely to be referred to and attend CR, sex differences in referral and participation (as well as barriers) in CR will be examined. Second, this study examines psychosocial variables as they relate to CR participation. Better knowledge about these issues would be useful in planning CR intervention strategies for maximum participation and recovery. It is postulated that male sex, lower anxiety, lower depressive symptomatology, higher levels of social support, lower number of negative life events or losses and higher self-efficacy will be significantly predictive of CR attendance six months following an ICE.

3. Method

3.1. Participants

Eighteen hundred patients from twelve coronary intensive care units (CICUs) across South-central Ontario, Canada who were diagnosed with myocardial infarction (MI) or unstable angina (UA) were approached for the study. These participants were part of a larger sample of participants taking part in a study examining sex differences in acute ischemic cardiac events. Some participating hospitals were urban teaching hospitals, while others were located in medium and small-sized cities. Approximately 500 patients were ineligible (i.e., too ill, unable to read or speak English) to participate in the study, and 906 patients (586 men, 320 women) consented to participate in the study. The response rate was 69%. Of this participant group, 541 participants (60%) returned completed questionnaires six months after discharge from hospital. Fifty-three percent had a confirmed myocardial infarction, and 47% were diagnosed as unstable angina. Their ages ranged from 31 to 93 years with a mean age of 61.9 years. Seventy-four percent of the participants were married, and 45% had a family level of income over \$50,000 annually.

3.2. Procedure and design

This was a prospective longitudinal study over six months following an ICE. Participants were recruited in the

CICU by a research nurse on the second to fifth day of hospitalization. Inclusion criteria consisted of patients who were diagnosed with a confirmed MI or UA and who were 18 years of age or older. Exclusion criteria consisted of patients who were too ill or confused to participate, or unable to read or speak English. Those who met study criteria and agreed to participate signed a consent form and were provided with a survey. The questionnaire consisted of demographic, disease-related and psychosocial measures. Participants were also mailed a follow-up questionnaire six months later. The study was approved by the University Health Network Research Ethics Board.

3.3. Measures

In addition to the instruments outlined below, sociodemographic data were collected; date of birth, sex, marital status, level of education, level of income and living situation. Several items were included to assess whether participants were advised to attend CR, reasons why they did or did not attend, and aspects of the CR program they attended.¹

Depressive symptoms were assessed by the Beck Depression Inventory (BDI) [26], a reliable and well-validated 21-item scale using a forced-choice 4-alternative response format that has been widely used in the general population, and in chronic illness populations including cardiac patients [8,27–30]. Higher scores reflect greater depressive symptomatology. The vegetative subscale consists of 8 items regarding symptoms of sleep or appetite disturbance, and constipation. The psychological subscale consists of 14 items regarding cognitive and affective symptoms such as guilty feelings or sense of punishment² [26,31]. The internal consistency of the BDI was $\alpha=0.87$ at baseline in the current sample.

The Primary Care Evaluation of Mental Disorders (PRIME-MD) [32,33] is a self-administered questionnaire that screens for 5 of the most common groups of DSM-IV [34] disorders, including anxiety disorders. The anxiety subscale consists of 13 yes/no questions about symptoms and signs present during the past month.³ Reliability and validity of the scale is well-demonstrated [32,33,35].

A modified version of the 16-item Arthritis Beliefs Scale [36] was used to assess self-efficacy. The scale uses a 5-point Likert format, with higher scores indicating higher levels of self-efficacy. This scale was used in a sample of cardiac patients [37]. The internal reliability of the scale was high in the current sample (Cronbach's $\alpha=0.88$ at six months).

Social support was measured by one item asking participants to rate the support they receive from friends and family members (other than partner) on a five-point Likert

¹Contact the first author to obtain a copy of these items.

²One item applies to both subscales and was therefore included in both.

³Symptoms were probed during the past two weeks in the current study.

scale ranging from very unsatisfactory to very satisfactory. Participants were also requested to indicate if they had experienced any of 13 major life events, losses, or changes in the five years before admission to CICU. Total number of events/losses were summed for a range from zero through thirteen.

3.4. Statistical analyses

A descriptive examination of the variables was performed. Sex differences in the variables of interest were tested using Likelihood ratio χ^2 analyses and *t*-tests. A logistic regression analysis was used to examine which psychosocial variables significantly predicted attendance at CR six months post discharge from CICU.

4. Results

4.1. Sex differences in participant sociodemographics

Sex differences in marital status, age, education and family income were assessed. There was a significant sex difference in marital status $\{\chi^2(3)\} = 128.405, P < .001$, where more women in the sample were widowed, while more men were married or common-law. There was a significant sex difference in family income $\{\chi^2(3) = 73.612, P < .001\}$, where men had significantly higher annual income than women. There was also a significant sex difference in level of education $\{\chi^2(3) = 11.689, P = .009\}$, where men were more highly educated than women. The mean age was 59.97 for men and 65.83 for women, and this difference was statistically significant ($t(648) = -6.620, P < .001$).

4.2. CR referral, assessment, and participation

At six months after the ICE, 149 (28.3%) of the 541 participants were referred to CR by a physician. However, other people also recommended CR attendance (see Table 1), and overall, 210 (38.8%) participants were referred to CR. There was a significant sex difference in referral by physician to attend CR (Likelihood ratio $\chi^2(1) = 7.330, P = .007$, Cramer's $\phi = 0.166, P = .008$). Relative to women, men were 1.187 times more likely to be referred to CR by a physician or cardiologist (95% C.I., 1.056–1.334).

Participants were also questioned about other types of referral, reasons for no referral, and inclusion of family and friends in discussion of referral. For 49 participants (13.5%) a reason was provided for the lack of referral to a CR program, but for 168 participants (68.9%) no reason was provided. For 76 participants (31.1%), family and friends were involved by a doctor or nurse in the discussion about CR, while for 168 participants (68.9%) they were not. Seventy participants (14.3%) were referred to an education program or support group other than CR.

Table 1
Who recommended cardiac rehabilitation assessment, n = 432

Person	Number of Participants (%)
No one	286 (66.2%)
Physician	149 (28.3%)
Nurse	69 (16.0%)
Spouse	53 (12.3%)
Friend/Other Family	45 (10.4%)
Child	39 (9.0%)
Other Patient	31 (7.2%)
Other Person	14 (3.2%)

One hundred and twenty-six participants (25.0%) then attended a CR assessment. Of the participants who were referred to CR, the most common reasons for not attending the assessment were other health problems, and inconvenient location (see Table 2). After CR assessment, 109 (21.5%) participants then attended a CR program. When asked about frequency of CR participation, 25% responded that they attended no sessions, 8.4% attended a few, 4.5% attended almost half, 27.7% attended most, 34.8% attended all of the CR sessions. The most frequent reason participants gave for not attending was inconvenient timing. When asked whether CR met individual needs on a scale from one (not a lot) to five (completely), the mean response was 3.78 (S.D. = 1.17).

Services offered and utilized in the CR program are outlined in Table 3. When asked which physical activities they would most likely participate in, respondents rated walking highest, and running on a treadmill lowest (see Table 4). There were significant sex differences in preferences for three physical activities: bicycling (Likelihood ratio $\chi^2(1) = 23.105, P < .001$, Cramer's $\phi = 0.209, P < .001$), running (Likelihood ratio $\chi^2(1) = 14.023, P < .001$, Cramer's $\phi = 0.143, P = .001$), and treadmill jogging/running (Likelihood ratio $\chi^2(1) = 11.245, P = .001$, Cramer's $\phi = 0.129, P = .004$). Relative to women, men were 1.325 times more likely to participate if they could bicycle (95% C.I., 1.189–1.477), 1.422 times more likely to

Table 2
Reasons for not attending CR assessment, n = 361

Reason	Number of Participants (%)
No one recommended it	266 (73.7%)
Other health problems	31 (8.6%)
Inconvenient location	27 (7.5%)
Transportation difficulties	21 (5.8%)
Inconvenient time	14 (3.9%)
Expense	11 (3.0%)
Too sick	11 (3.0%)
Do not like exercise	10 (2.8%)
Not enough time with family	5 (1.4%)
Frightened of exercise	4 (1.1%)

Table 3
CR services offered and utilized, n = 123

Service	Offered	Utilized
Exercise classes	105 (85.4%)	97 (78.9%)
Symptom management classes	63 (51.2%)	53 (43.1%)
Stress management classes	63 (51.2%)	45 (36.6%)
Risk factor classes	70 (56.9%)	61 (49.6%)
Support groups	30 (24.4%)	21 (17.1%)
Nutritional counseling	84 (68.3%)	72 (58.5%)
Heart healthy cooking classes	45 (36.6%)	34 (27.6%)
Sexual activity information	36 (29.3%)	22 (17.9%)
Traveling information	27 (22.0%)	21 (17.1%)
Smoking cessation	25 (20.3%)	9 (7.3%)

participate if they could jog or run (95% C.I., 1.294–1.563), and 1.408 times more likely to participate if they could jog or run on a treadmill (95% C.I., 1.269–1.562). In regard to format of physical activities, 302 (62.0%) participants were most likely to participate if CR activities were built into daily life, 242 (49.7%) if CR activities were performed alone, 190 (39.0%) if CR activities used exercise equipment, and 177 participants (36.3%) were most likely to participate if CR activities were in a group format.

4.3. Predicting CR participation

A descriptive examination of the depression, anxiety, self-efficacy, social support, and life events/losses scores are presented in Table 5. One-third of the participants ($n = 277$) had BDI scores greater than 10 at baseline, indicative of at least mild depressive symptomatology. There was a significant sex difference in psychological and vegetative depressive symptomatology scores at baseline. Women had significantly higher levels of psychological depressive symptomatology ($t(547) = -3.764, P < .001$) and significantly higher levels of vegetative depressive symptomatology than men, ($t(586) = -6.632, P < .001$). Men demonstrated significantly higher self-efficacy at six months than

⁴Levene's test for homogeneity of variance was not satisfied. The results presented here do not assume equal variance. Levene's test was used for each of the following t tests to ensure assumptions were met.

Table 4
Preferred CR physical activities, n = 499

Activity	Number of Participants (%)
Walking	450 (90.2%)
Bicycling	169 (33.9%)
Treadmill walking	167 (33.5%)
Swimming	150 (30.1%)
Exercise classes	151 (30.3%)
Weight training	69 (13.8%)
Jogging, Running	29 (5.8%)
Treadmill jogging, running	24 (4.8%)

Table 5
Mean (and standard deviation) of psychosocial scores by sex

Measure	Range	Total	Male	Female
Total Events/Losses	0–13	1.92 (1.72)	1.73	2.33*
Vegetative Depression	0–41	3.19 (2.38)	2.81	3.88**
Psychological Depression	0–12	3.84 (4.96)	3.37	4.74**
Self-Efficacy	16–80	69.76 (7.31)	70.56	68.10**
Social Support	1–5	4.39 (1.09)	4.43	4.32

* $p < 0.01$; ** $p < 0.001$.

did women ($t(519) = 3.607, P < .001$). There was also a significant difference in total number of life events/losses, with women experiencing significantly more than men in the five years before MI or UA ($t(255) = -3.395, P = .001$). There were no significant sex differences in social support from family and friends.⁵ Based on paper-and-pencil scores from the PRIME-MD⁶ anxiety subscale, 571 participants (63.4%) had scores indicative of no anxiety disorder, 62 participants (6.9%) had anxiety of short or unknown duration, 112 participants (12.3%) had anxiety symptomatology of 1 month duration, 52 participants (5.8%) had scores indicative of generalized anxiety disorder, and 103 participants (11.4%) had scores indicative of panic disorder. There was a significant sex difference in anxiety diagnosis ($\chi^2(4) = 21.171, P < .001$). A dummy variable was created consisting of no anxiety symptomatology versus any anxiety symptomatology. Again, sex was significantly associated with anxiety (Likelihood ratio $\chi^2(1) = 15.558, P < .001$, Cramer's $\phi = .132, P < .001$). Relative to men, women were 1.431 times more likely to have scores indicative of an anxiety disorder at the time of hospitalization (95% C.I., 1.201–1.704).

A direct logistic regression analysis was performed on participation in CR six months after an ICE as outcome with the following predictors: sex, depressive symptoms at baseline, anxiety at baseline, self-efficacy at six months, social support from family and friends at baseline, and total number of life events or losses in the five years before the coronary event. Sociodemographic variables shown to affect CR were entered in Block 1, namely referral from physician, family income, age, marital status, education, and total number of symptoms at baseline. Analysis was performed using SPSS LOGISTIC REGRESSION. A test of the full model with all predictors against a constant-only model was statistically reliable (Step 1: $\chi^2(1, N = 340) = 161.82, P < .001$; Step 2: $\chi^2(5, N = 349) = 10.82, P = .05$; Model: $\chi^2(6) = 172.63, P < .001$), indicating that the predictors, as a set, reliably distinguished between those who participated in CR six months following their coronary event, and those who did not. Sixty-one percent of the variance in CR participation is accounted for by this set of

⁵However, men did perceive significantly more support from partner than women.

⁶No clinical evaluation was performed.

Table 6
Results of logistic regression analysis predicting attendance at CR

Variable	B	S.E.	Wald	df	p	Odds Ratio	95% C.I.
Family Income	-.386	.14	7.49	1	.006	.68	.515-.896
Sex	-.257	.34	0.56	1	.453	.77	.395-.896
Anxiety	.627	.31	4.15	1	.042	1.87	1.024-3.421
Self-Efficacy	-.051	.02	5.37	1	.020	0.95	.910-.992
Social Support	-.246	.16	2.41	1	.121	0.78	.572-1.067
Losses	.100	.09	1.27	1	.261	1.11	.929-1.314
Model Chi-Square			26.55				
Nagelkerke R ²			0.11				

predictors (58% by referral from physician alone). Prediction success was 87.6%. According to the Wald criterion, referral from a doctor and total number of life losses reliably predicted CR participation. Psychosocial factors did significantly contribute to the prediction of CR participation over and above referral.

A second logistic regression was run without referral from physician to determine which factors differentially affect CR participation if all eligible patients were referred. At step one the sociodemographics were entered, and psychosocial factors at step two. Variables that were not significantly contributing but may be causing multicollinearity were removed from the model (see [38]). After deletion of 199 cases with missing values,⁷ data from 342 participants were available for analysis: 76 who participated in CR six months following their coronary event, and 266 who did not. A test of the full model with all predictors against a constant-only model was statistically reliable (Step 1: $\chi^2(3, N = 342) = 14.29, P = .003$; Step 2: $\chi^2(5) = 13.22, P = .021$; Model: $\chi^2(8) = 27.51, P = .001$), indicating that the predictors, as a set, reliably distinguished between those who participated in CR six months following their coronary event, and those who did not. Twelve percent of the variance in CR participation is accounted for by this set of predictors. Prediction success was 78.1%. According to the Wald criterion (see Table 6), three variables reliably predicted CR participation. The odds ratios demonstrated that higher family income, anxiety and higher self-efficacy were predictive of CR participation six months following a coronary event.

5. Discussion

Despite the well-substantiated benefits of CR on ICE recovery and the prevention of recurrent coronary events, less than one-third of participants were referred by their physician in the six months following their ICE. This refer-

ral rate represents 12 hospitals across South-central Ontario. Similarly, in a sample of 245 post-MI patients in the United States, 30% were referred to CR by a physician [39]. Even fewer participants were provided with an explanation regarding why they were not referred.

Referral from a physician has been shown to have a strong effect on participation in CR [16,40], and referral accounted for almost 60% of the variability in CR participation in this sample. Clearly, many referrals stemmed from the other allied health professionals and the lay public [16]. Studies have shown that adult children are influential in women's decision to attend CR [13]. However, few significant others recommended CR participation among women, and in less than one-third of participants were family and friends involved in the discussion about CR.

Women were even less likely to be referred by their physicians than men. This could be due to the older age of the women at the time of ICE, or the presence of comorbid conditions, however the referral rate after controlling for perceived health condition remained discouragingly low. Similar gender differences are noted in American samples, and even after controlling for CR eligibility through a chart audit, 67% of eligible males and 48% of eligible females were referred for CR by their physician. Whether the lower physician recommendation is due to an impression that CR is less effective in women, a subtle manifestation of patient dislike of physical exercise, or a straightforward bias cannot be determined from the present study.

Over and above referral failure, barriers to participation in CR may also be psychosocial in nature. When predicting participation with psychological and sociodemographic variables, anxious symptomatology, self-efficacy and family income were paramount. Participants with anxiety symptomatology, higher self-efficacy and higher family income were more likely to participate in CR.

Depressive symptoms and major depressive disorders are common in patients with CVD [41], and in women in particular [7,24,30]. The prevalence of major depression in patients with CVD ranges from 15-23%, which is approximately three-fold higher than age-matched community-based prevalence studies [42]. Older women in particular are found to suffer from the vegetative signs of depression, such as slowed speech and movement, disinterest in eating and exhausting fatigue [7]. Consequently, comorbid depression can decrease the likelihood of adhering to recommended behavior and lifestyle changes such CR participation [43-45], which in turn can increase the risk of future coronary events [20,30,46]. CR programs have been shown to have a beneficial effect on depression following a coronary event [24,47,48,49]. Although depression has been found to be negatively related to CR attendance, in our study depressive symptomatology was not related to participation. Depression is an integral predictor of coronary events, but may not play a strong role in CR participation per se.

Anxiety is one of the earliest and most intense psycho-

⁷SPSS LOGISTIC REGRESSION employs listwise deletion of cases.

logical responses to ICEs [29]. In one study of MI patients, more than two-thirds had anxiety levels that were considered above normal, and 26% had levels equivalent to or above those seen in psychiatric in-patients [5]. Again, women seem to be at greater risk of anxiety after a coronary incident than men [17,20,44,50]. Anxiety may be addressed by CR through reducing uncertainty, providing patients with an optimistic but realistic outlook on recovery, providing psychological support, and promoting coping. In this sample, the presence of anxiety was related to CR participation. The stress surrounding the coronary event, and the motivation to physically recover may be an important instigating factor in CR participation.

Self-efficacy may be defined as an individual's judgment of his or her capabilities to organize and execute courses of action required to attain performance goals [51]. Because CR places considerable emphasis on physical skills, women's perceptions of their physical abilities may influence their decision to participate in CR. Women tend to have lower self-efficacy than men, and those with lower self-efficacy generally display lower adherence rates to CR programs [17,52]. Greater self-efficacy was significantly predictive of CR participation in this sample.

Support has been found to have a positive effect on the promotion and restoration of health, particularly following a coronary [53–55]. In women [16,56], and in men [2,41] lack of support is related to poorer outcome after a coronary event, however this relationship is less consistent in women [57,58]. Social support from both health professionals and family members plays an important role in CR programs instituted following a coronary event [58–61]. The literature has focused most exclusively on spousal support, however psychosocial adjustment during CR can stem from various support sources such as adult children, extended family, friends, and broader social networks, particularly among women [13,59]. Size of the support network may also have an effect on exposure to both positive and negative life events from individuals in one's network.

Contrary to the literature, social support was not predictive of CR participation in the current sample. Social support from spouse has generally been shown to have a protective role in cardiac recovery [58], and to provide incentive to participate in CR programs [16]. However, this study focused on the under-studied area of support from family and friends rather than spouse, as nonspousal supports may be more pertinent for women who are less likely to be married at the time of their ICE (generally because they are older and widowed).

An explanation for the lack of effect of support could relate to size of the support network. Perhaps because women are more often single or widowed at the time of an ICE, they may have a wider support network, thus amplifying exposure to a wider range of both positive and negative influences. It has been suggested that negative aspects of relationships (such as conflict and criticism from extended family or friends) can be detrimental to cardiac

recovery and psychosocial adjustment [62]. Future studies should examine nonspousal support in a multidimensional manner, to more fully understand the positive and negative influences of nonspousal support in the domains of emotional sustenance, informational guidance, and tangible assistance [63].

Family income was the only sociodemographic variable which was significantly predictive of attending CR, and has been shown to be a strong indicator of socioeconomic status [64]. This effect is found despite the universal healthcare system in Canada where CR programs are free. Women in this sample had significantly lower family income than did men, thus it is suspected that family income accounted for the variability in sex rendering it nonsignificant. The question is how to engage a wider range of patients into CR programs, such as those of lower socioeconomic status or those with lower self-efficacy. Clearly, CICUs and comprehensive CR programs should include appropriate mental health professionals to identify and address these vital psychosocial aspects of recovery.

There are several limitations to these findings. It was not possible to contact all health professionals with whom participants had contact to determine whether or not participants were eligible for CR based on universal recommendations. It is presumed however that participant ineligibility would not account for the preponderance of low referrals. Although this study examined CR participants prospectively, causal inferences cannot be made. This study failed to examine ethnocultural background, as the majority of the participants were Caucasian to ensure comprehension of survey materials. The measures of social support and life losses were not psychometrically validated, and the social support measure itself was based on one item. There may be bias based on participants who chose to take part in the study versus those who declined. The fact that all participants were enrolled in Canada's health care system may limit the generalizability of findings to other jurisdictions, however it also ensures universal access to the same care by all participants thus representing a fuller range of socioeconomic levels than is possible in many studies.

In conclusion, because virtually all studies demonstrate that women benefit from CR, health professionals, family, and friends need to be informed about sex differences in referral for CR, and about the motivating influence of their recommendations and encouragement. Moreover, the effect of socioeconomic status on CR participation calls for a broad perspective on the determinants of cardiac recovery and health outcome. Signs of anxiety and low self-efficacy should be identified and attended to in order to maximize recovery from ICE. Because women may be at particular psychological and sociodemographic risk in the context of CVD, the assessment of these psychosocial factors may be especially relevant to managing the psychosocial rehabilitation of women after an ICE.

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